IEC 61850-4

Edition 2.0 2020-11

INTERNATIONAL STANDARD

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AMENDMENT 1
AMENDEMENT 1

Communication networks and systems for power utility automation – Part 4: System and project management

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Réseaux et systèmes de communication pour l'automatisation des systèmes électriques – Partie 4: Gestion du système et gestion de projet

IEC 61850-4:2011/AMD1:2020
https://standards.iteh.ai/catalog/standards/sist/e7e406f1-96fe-4321-8617-[illegible]d1-2020

IEC 61850-4:2011-04/AMD1:2020-11(en-fr)

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FOREWORD

This amendment has been prepared by IEC technical committee 57: Power systems 2 management and associated information exchange.

The text of this amendment is based on the following documents:

FDIS	Report on voting
57/2256/FDIS	57/2271/RVD

Full information on the voting for the approval of this amendment can be found in the report on voting indicated in the above table.

The committee has decided that the contents of this amendment and the base publication will remain unchanged until the stability date indicated on the IEC website under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

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1 Scope

Replace the existing text of the first paragraph of the scope with the following new text:

This part of IEC 61850 applies to projects associated with processes near automation systems of power utilities (UAS, utility automation system), such as substation automation systems (SAS). It defines the system and project management for UAS with communication between intelligent electronic devices (IEDs) in the substation respective plant and the related system requirements.

2 Normative references

Replace the existing reference to IEC 61850-6 with the following new reference:

IEC 61850-6, *Communication networks and systems for power utility automation – Part 6: Configuration description language for communication in power utility automation systems related to IEDs*

Delete the references to IEC 81346-1 and IEC 81346-2.

4 Abbreviations

Add the following new abbreviations:

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icd IED capability description file

ICT IED configuration tool

iid instantiated IED description file

scd substation configuration description file

SCT system configuration tool

sed system exchange description file

ssd system specification description file

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5 Engineering requirements

5.3.4 IED configuration tool

Replace the existing text of the fifth paragraph of 5.3.4 with the following new text:

The tool's data input module supports the interactive input of parameters as well as the import of the system description as created by means of the system configuration tool. The structure of input data should be technically oriented towards the process architecture, i.e. structured according to the hierarchical approach to substation, voltage level, bay, equipment and function.

Replace the existing text of the first bullet with the following new text:

– process (e.g. substation or line) identification;

Add the following new subclause after 5.3.5:

5.3.6 Engineering tool workflow

5.3.6.1 From system specification to project description

Typical use case: one centralised SCT working with several ICT (see Figure 12).

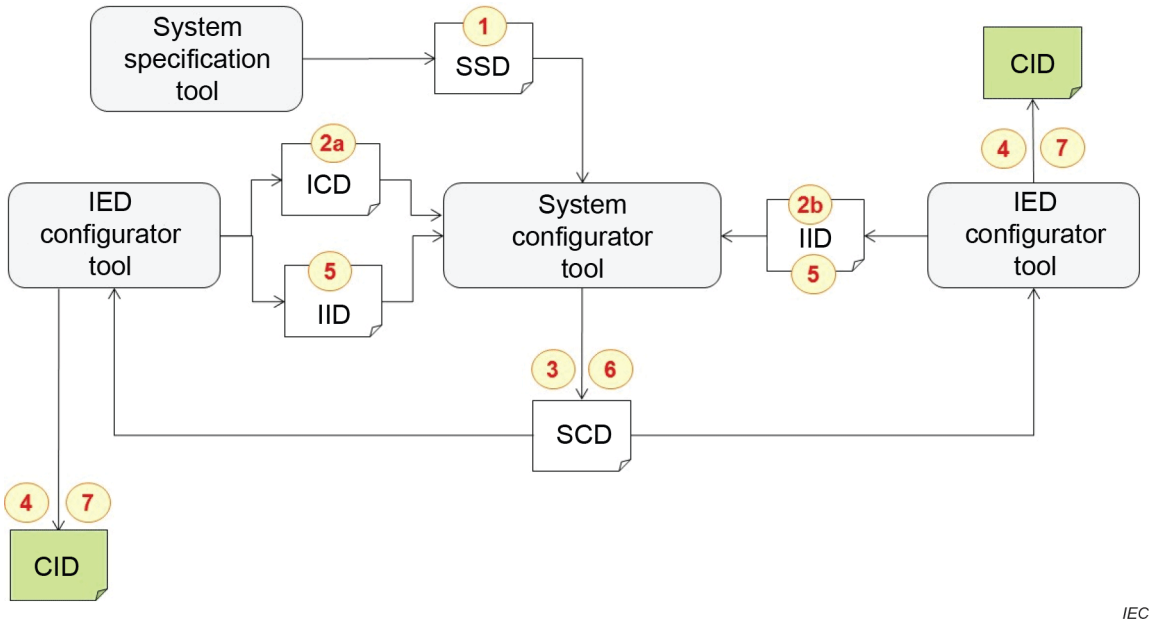

Figure 12 – Engineering workflow steps from system to project

Step 1: System Specification Tool (SST) creates an ssd file according to IEC 61850-6.

Step 2a: IED Configurator Tool (ICT) creates an icd file according to IEC 61850-6.

Step 2b: ICT creates an iid file according to part 6.

Step 3: System Configuration Tool (SCT) creates an scd file, using previous files: ssd, icd and/or iid.

Step 4: This SCD is used by an ICT to finalize configuration and publish an cid file to its related IED (configuration of dataflow).

The fourth step is the last except if the scd contents requires modifications from the ICT, which shall be transferred to the SCT in order to publish a updated scd. Then it is replaced by step 5 hereafter.

Step 5: ICT updates the IED description based on the further IED configuration needs and on system configuration needs provided by SCT in step 3. The ICT exports to the SCT the updated configuration description via the iid file.

Step 6: SCT publishes a updated scd file taking into account information described by previous IID.

Step 7: ICT publishes the updated cid file to send to the IED, using the scd published on step 6.

5.3.6.2 Change of system tool

Use case: considering an SCT A has to be replaced by an SCT B. The context is transferred with an scd exported from the SCT A.

The creation of the project with SCT A is similar to the previous use case and is assumed to be done before the replacement of SCT A as classical project engineering as shown in Figure 13.

NOTE Changing an SCT is always done with the purpose of updating / upgrading the system configuration with features that previous SCT does not support.

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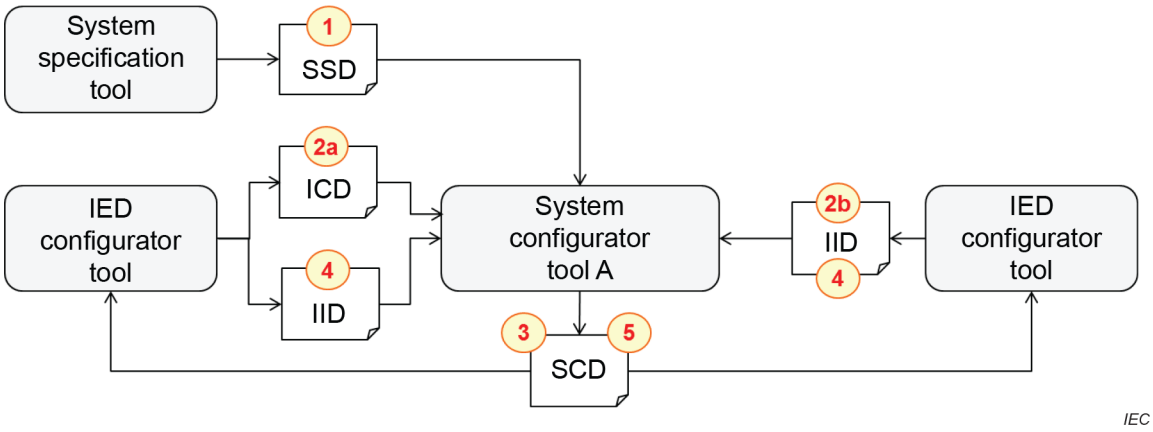

Figure 13 – Change of system tool first stage

Step 1: System Specification Tool (SST) creates an ssd.

Step 2a: IED Configurator Tool (ICT) creates an icd.

Step 2b: ICT creates an iid as a first instantiation.

Step 3: SCT creates an scd, using previous files: ssd, icd and iid.

Step 4: ICTs create iid using the scd issued on step 3.

Step 5: SCT publishes a new scd taking into account information described by previous iid.

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Hereafter the second stage, the SCT B uses the scd provided by the SCT A as shown in Figure 14.

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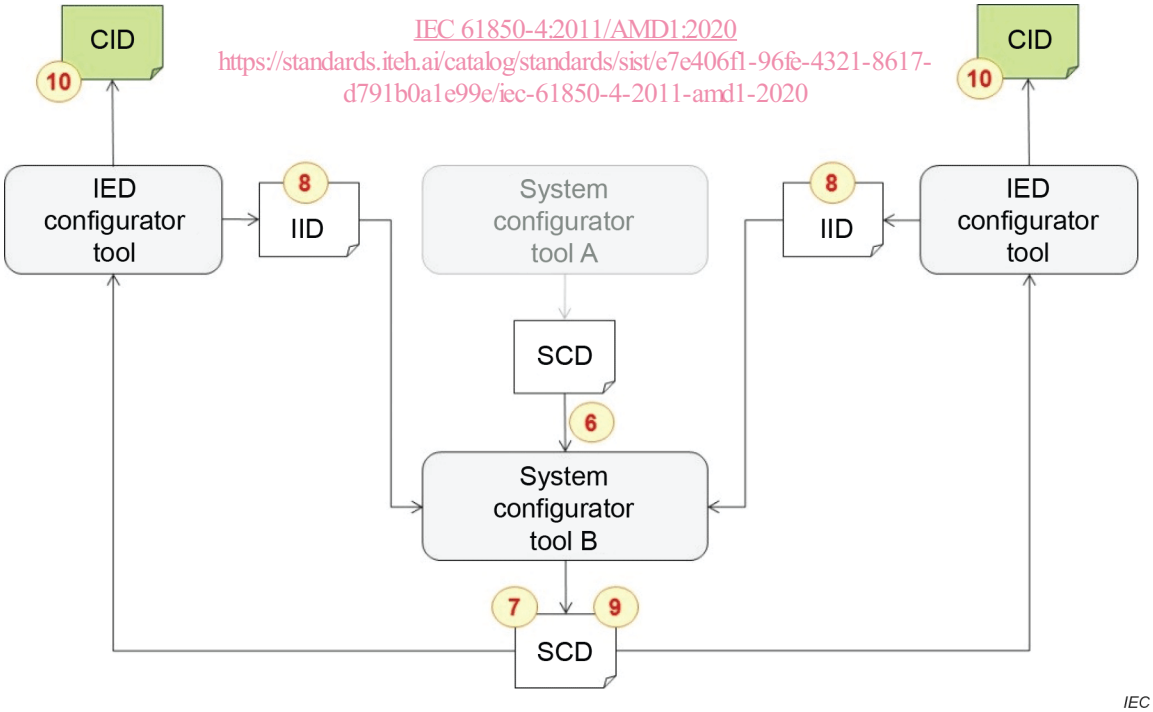

Figure 14 – Change of system tool second stage

Step 6: SCD to be transferred by SCT A to SCT B. Even if that does not appear on the scheme, it is strongly recommended to also transfer the latest version of all icd files.

Step 7: SCT B updates the scd, using previous scd created by SCT A (previous step).

Step 8: ICTs create iid using the scd issued on step 7.

Step 9: SCT publishes a new scd.

Step 10: ICTs create cid using the scd previously created.

5.3.6.3 Interaction between projects

Use case: considering 2 different configuration projects managed by 2 SCT A and B (The 2 configuration projects may cover one or multiple UAS). One IED (e.g. IED 2) regards both projects. The cid intended to the IED 2 shall take into account both contexts. The final step is the publishing of the cid.

Hereafter, the first stage consists of the publishing of the SCD, as shown in Figure 15.

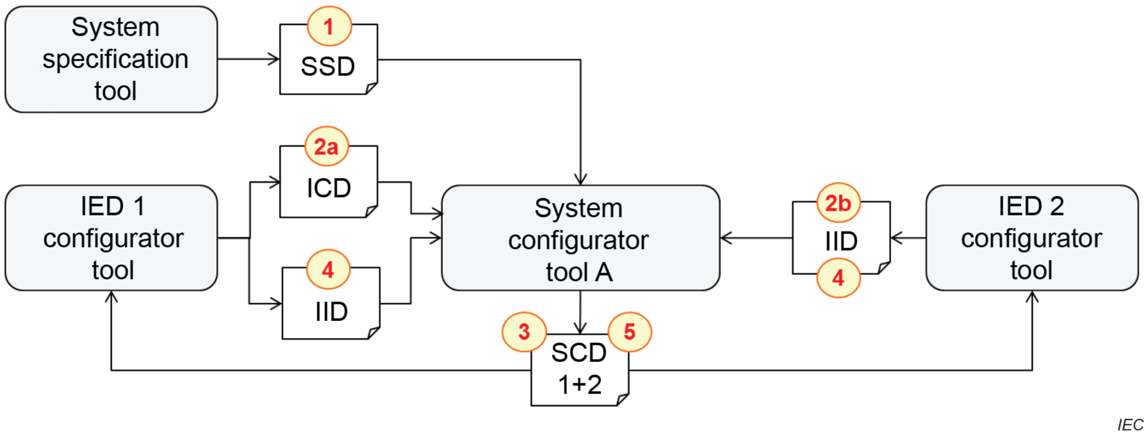

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Figure 15 – Interaction between projects, first stage

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Step 1: System Specification Tool (SST) creates an ssd.

Step 2a: IED 1 Configurator Tool creates an icd.

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Step 2b: IED 2 Configuration Tool creates an iid as a first instantiation.

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d791b0a1e99e/iec-61850-4-2011-amd1-2020

Step 3: SCT creates an SCD 1+2, describing both IED 1 and IED 2 and using previous files: ssd, icd and iid.

Step 4: ICTs create iid using the scd issued on step 3.

Step 5: SCT publishes a new scd 1+2 taking into account information described by previous IID.

Hereafter, the second stage consists in using part of the scd 1+2, that is involved in the communication of a second project, as shown in Figure 16.

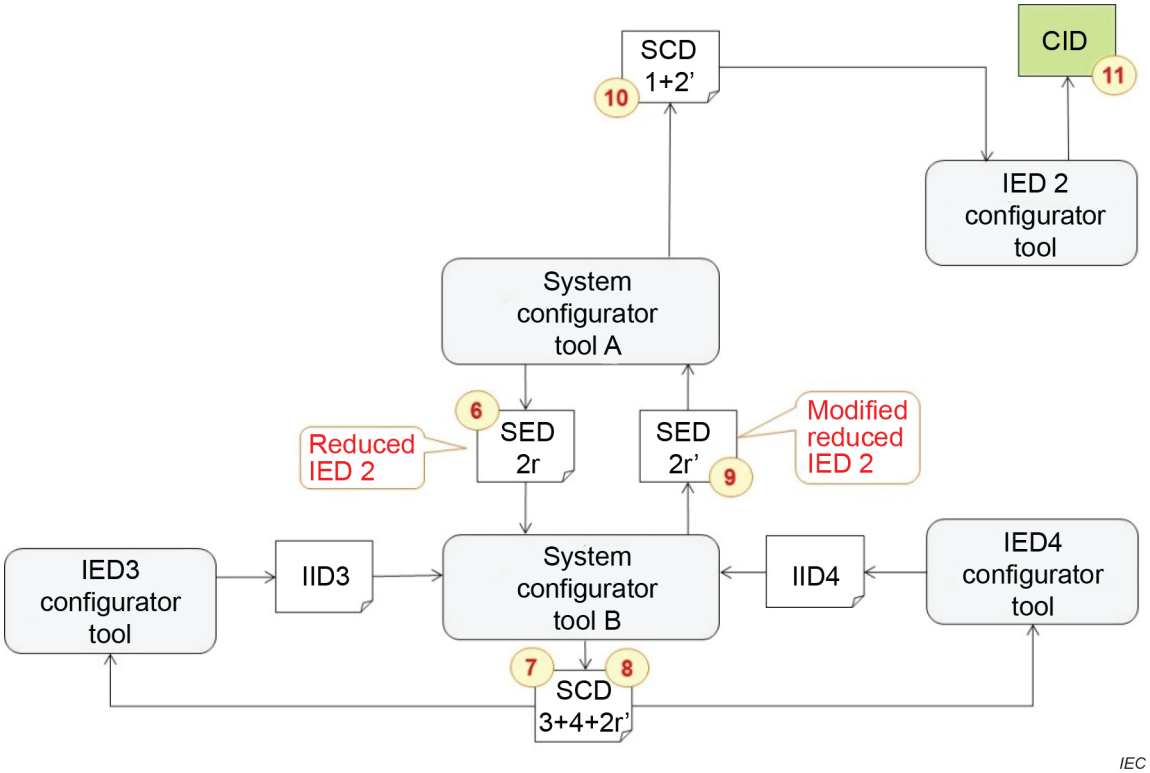

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Figure 16 – interaction between projects, second stage

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Step 6: SCT A creates an sed 2r, which gives only required information on the IED 2 needed for the engineering of the second project. (therefore "reduced IED 2")

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Step 7: SCT B creates an scd 3+4+2r', using the sed 2r created by sct A (previous step) and taking into account its own context.

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Step 8: ICTs create iid using the scd 3+4+2r'.

Step 9: SCT B creates a new sed 2r' taking into account IED 2 in the SCT B context.

Step 10: SCT A creates a new scd 1+2' using the sed 2r' to integrate dataflow modifications of IED 2 coming from the sct B.

Step 11: ICTs create cid using the scd previously created.

5.5 Scalability

Replace the existing text of the first bullet with the following new text:

– task (transmission/distribution/power plant/DER/… networks) and voltage range (medium, high or ultra high voltage) of the substation;

5.7 Standard documentation

Replace the existing text of the first paragraph with the following new text:

The standard documentation is the description of the device and the functions of one IED or the UAS product family of a manufacturer which is universally valid and which is not changed for purposes of specific projects (refer to CIGRE – TB628 – *Documentation requirements throughout the lifecycle of Digital Substation Automation Systems – B5-39*).

Add the following new text after 5.8:

5.9 System testing and engineering

Functional testing of the system, especially for maintenance testing, but also during FAT and SAT, requires the preparation of the system configuration to support testing.

The testing concept must be defined by the user at an early stage of the project, since this comes with additional requirements impacting the system design and configuration, see IEC 61850-10-3.

6 System life cycle

6.1 Requirements of product versions

Replace the existing text of 6.1 with the following new text:

The life cycles of an UAS and its IEDs are subject to differences of the manufacturer's and the customer's point of view, as shown in Figure 17:

– the manufacturer's product life cycle contains the period between the start of production and the discontinuation of the UAS product family;

– the customer's system life cycle contains the period between the site commissioning of the first system installation, often based on several UAS product families, and the decommissioning of the latest system installation. The system installation may be carried out by a system integrator who is different from the product manufacturer.

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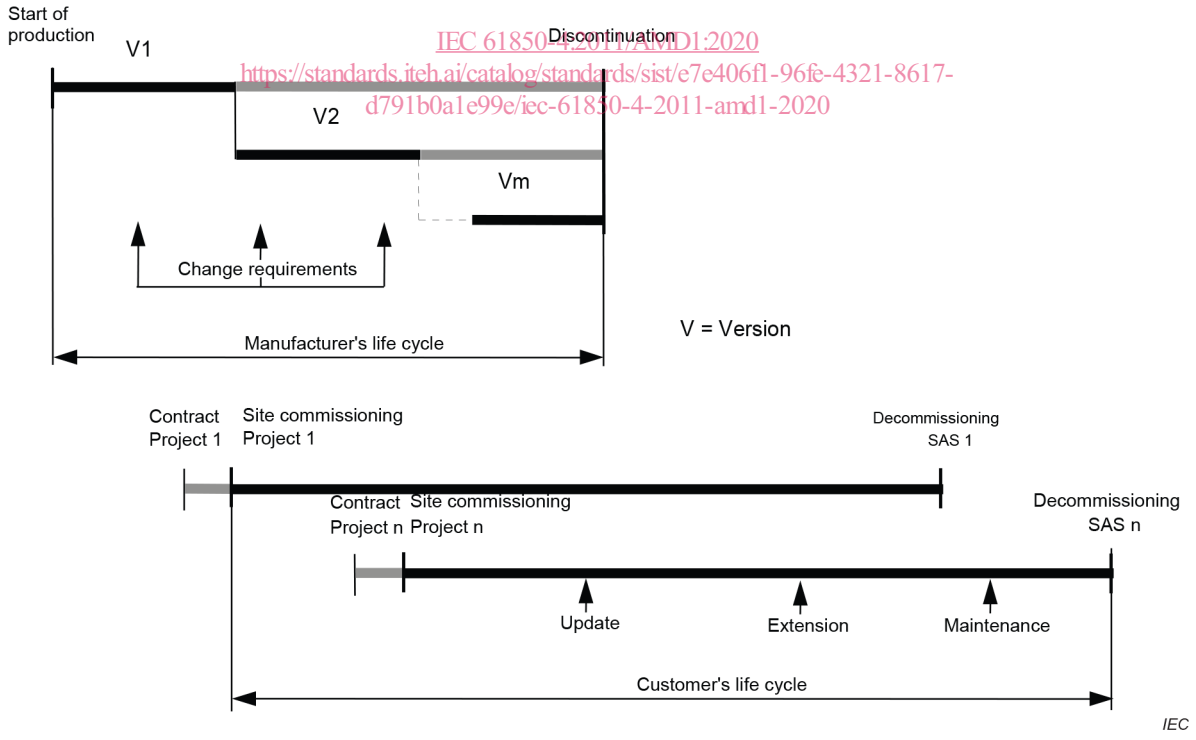

Figure 17 – Two meanings of the system life cycle

During the life cycle of the UAS and its IEDs, a number of changes and extensions are required for various reasons:

– functional improvements and extensions;

– technology changes in the hardware;

– correction of recognized problems.

These changes can lead updating IED versions of hardware, software or even engineering tools. Different use cases are identified and developed later (ref. backward compatibility).

Whatever the use case, the manufacturer is obliged to provide identification of the IED versions (software, firmware, hardware, configuration, revision):

– in the case of IED software or the supporting tools software, the version information is available in a self identifying manner (for example, on display or PC);
– for the hardware, the version information is available at IED level (either physically or by tool);
– if the functionality has changed or a function has been removed, a new configuration compatibility list shall be distributed.

The co-ordination of the manufacturer's and the customer's life cycles requires that new versions of the IEDs with identical model numbers shall comply with the following rules.

a) The hardware shall be compatible. All interfaces must perform the same function in the same places. The sizes of the boards and the devices must be identical.
b) The functional changes from the previous version of the product software shall be declared. This includes any impact on IEC 61850 interface of the device. This information will help the customer knowing the impact on their IEC 61850 system using this device.
c) The supporting tools shall be downward compatible, which means that the new version of the supporting tool shall serve all existing versions of the same product family.

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The manufacturer has to inform the customer about all of the functional changes and extensions that are carried out between the last production release and most recent production release.

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From an UAS system maintenance perspective identical or backwards compatible products are preferred for replacement of failed parts. In case that functionally but not engineering wise compatible products are used in this case, a re-engineering of a part of the UAS might be necessary.

Add the following new text after 6.3:

6.4 Backward compatibility

6.4.1 General

As mentioned in 6.3, the life cycle of an UAS and its IEDs involve several changes. These may come from:

– the manufacturer for including improvements, new functionalities and-or bugs correction;
– the customer for taking into account extensions or new requirements;
– the new edition of the standard.

This chapter deals with replacement or extension whatever the component is provided by the same or a different manufacturer. It scrutinizes, through four use cases, taking into account what is standardize in the actual IEC 61850 SCL configuration process what can be the encountered issues.

Considering the system is operated, the utilities point of view is highlighted.

NOTE 1 If the backward compatibility is not possible following standard advice, a mitigation plan shall be supplied by the manufacturer.

NOTE 2 If for any reason, the backward compatibility of the standard itself must be broken, the mitigation solutions has to be handled by the SCT as described in Part 6 annex I.

NOTE 3 It is understood that Edition 1 is a special case not considered. The discussion is about future Editions/Implementations.

6.4.2 Components

- New IED: replaces an IED for any reason or is an extension of an existing system;
- Clients: IEDs which are only client or subscriber of the new IED, which means the communication between station and bay level (ref. to 61850-5: IF1 and IF6) or between bay and process level (ref. to 61850-5: IF4 and IF5);
- Interacting IEDs: IEDs which are server or publisher for the new IED. Typically means the communication at the bay level, within the bay or between bays (ref. to 61850-5: IF3 and IF8).
- Other IEDs: every IEDs, which do not have any relation with the new IED.
- Configuration Tools: means SCT (System Configuration Tool) possibly ICT (IED Configuration Tool).

6.4.3 Use cases

Four use cases are identified:

No new functionalities required.

1) Replacement of one IED with one coming from the same manufacturer (UC1);
2) Replacement of one IED with one coming a different manufacturer (UC2);
3) Extension with addition of one IED into an existing system (UC3);

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New functionalities required:

1) Extension of the system with new functionalities (UC4).

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NOTE In the following sections, to avoid designating some particular editions of IED 61850 devices (e.g. Ed1 system with an added Ed 2 device), the Ed n and Ed n+m designations will be used to cover all possibilities (eg ED 2 system with added Ed 3 device, or even Ed3 system with Ed 5 device ect). What matter here is Ed n+m has later edition than Ed n.

6.4.4 Impacts

6.4.4.1 General

Depending on whether it is a new release (i.e. interoperability tissues have been implemented) or a new version/revision (i.e. new edition of the standard), the three following possible impacts are studied for each component previously listed:

- changing or modifying the configuration, which means in creating an updated SCD file and potentially a new CID;
- upgrading the firmware of IED(s);
- upgrading the SCT and, other ICT.

The table shown in Figure 18 is used to detail which impact are acceptable or not:

	IEC 61850 Configuration impact (which part of the .scd shall be updated)	Upgrade Firmware of device	Upgrade IEC 61850 configuration Tool (upgrade of ICT for devices / upgrade of SCT for entire system)
New IED		NA[a]	NA[b]
Client (s)			
Interacting IEDs		y	
Other IEDs			
Entire 61850 System	NA[c]	NA[d]	x

[a] a new IED does not need firmware upgrade as it is new

[b] a new IED comes with a new ICT already upgraded

[c] entire system configuration update (all IEDs) is covered by selecting all the others in this column (New IED + Client(s) + Interacting IEDs + Other IEDs)

[d] entire system firmware upgrade (all IEDs) is covered by selecting all the others in this column (Client(s) + Interacting IEDs + Other IEDs)

Selected case (■: dark blue filling) means needed. If any, "x" is a number that refers to an explanation.

Partially selected case (■: light blue filling) means needed under certain condition. If any, "y" is a number that refers to an explanation.

Non-selected case (blank) means there shall be no impact (e.g An IED not concerned by new features shall not be affected).

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Figure 18 – Template table of acceptable impacts

6.4.4.2 First use case (UC1)

Replacement of one IED with a new one coming from the same vendor, with equal behaviour, without any impact on system configuration, as shown in Figure 19.

In that case, the vendor shall be able to provide a way to configure the new IED (especially the data model) that mirrors the older device configuration (event if the new device supports a newer edition of IEC 61850)